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THE USEFUL PLANTS OF COPAN¹

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LIKE their descendants who inhabit Guatemala and Yucatan at the present day, the ancient Maya were doubtless an agricultural people who depended principally upon maize, beans, and squashes for their staple foodstuffs, cultivating in addition a number of other crops which played a less important part in their dietary.

Considering a particular portion of the Maya territory, the valley of the Copan river in western Honduras, what were some of the plants which produced foodstuffs or were otherwise useful to the ancient inhabitants? In attempting to answer this question several lines of investigation have been followed. First a catalog has been made of the useful plants found in the valley at the present time, as determined by two visits to the region in the spring of 1917. Next by studying the known geographic distribution of the various species in this list it is possible to indicate which were probably in the region in pre-Colombian times and which are of recent introduction. And finally, taking the species known to be indigenous, the utilization of certain of them by the ancient Maya is borne out by archaeological observations; while others lacking direct confirmatory evidence of this character must be considered to have played a part in the economy of the Maya solely because they have very evident uses, and because they are known to have been in the region since a remote period.

¹ I am greatly indebted to Mr. W. E. Safford of the Bureau of Plant Industry for carefully criticizing the manuscript of this paper, and for adding numerous items of interest.

If, as believed by archaeologists, the ancient inhabitants of Copan were bound by ties of commerce with the peoples of contemporaneous cities to the northward, such as Quirigua, Menche Tina-mit,¹ and Palenque, there was probably an exchange of many important articles between these different regions. The Quirigua region in the lower Motagua valley, because of its proximity to Copan, must certainly have been drawn upon for many plants which do not exist at the higher elevation of Copan. However, the plants grown in the region of Copan itself are the only ones which will be considered in this paper.

The valley of the Copan river is one of those favored spots which are scattered here and there throughout Central America. There are many others very similar in character, and wherever one of them is found, it will generally be observed that it has been the scene of intense agricultural activity for centuries. Perhaps there have been periods when the forest has been allowed to reclaim the soil, as has been the case at the ancient city of Copan in recent centuries, but the unusual natural advantages of these regions have assured their cultivation, more or less continuously, since the earliest times.

Varying elevations give these Central American valleys different climatic conditions. Those in the lowlands are hot and humid, and the rank tropical vegetation is much more difficult to control than it is at elevations of 2,000 feet or more. In Guatemala, some of the most fertile and intensively cultivated valleys lie at elevations of 3,000 to 5,000 feet. The ancient Maya, however, seem generally to have chosen lower elevations. Among the sites of their capitals, Copan is one of the highest. The elevation here, as closely as could be calculated from a series of readings taken with an aneroid barometer, is 1,900 feet. The climate, therefore, is not so hot as that of Quirigua, and the exuberant tropical vegetation of the latter place is conspicuously lacking. Agriculturally considered, however, Copan would appeal to the modern European as a much more favorable region than Quirigua.

If we accept the hypothesis of Prof. Ellsworth Huntington, to

¹ More generally known as Yaxchilan.

the effect that there has been a shifting of the climatic zones throughout the Maya territory, with the result that regions now considered almost uninhabitable were formerly much more salubrious, it is easy to understand the presence of thriving communities in such regions as the Usumacinta valley. Without some such hypothesis it is difficult to explain the facts as observed. In the case of Copan, however, there seems to be no reason why the site could not have been occupied by the ancient Maya under the same climatic conditions which obtain today.

The rainy season at Copan begins early in May and lasts until January. While there is no accurate means of judging, the amount of rainfall may be about the same, or slightly heavier, than it is in the Guatemalan highlands. At Guatemala city the range is from 30 to 60 inches, with an average of about 50 inches. At Copan it may perhaps be 50 to 70 inches, judging from the length of the rainy season and the character of the vegetation.

The hottest part of the year is toward the end of the dry season April and May—while the coolest part is from November to January. Copan is not high enough in elevation to experience any very cold weather, such as occurs in parts of the Guatemalan highlands. Its minimum temperature is probably between 40° and 50° F.

On uncleared slopes and knolls in the upper end of the valley the forest, which is doubtless a remnant of that which extended over the entire valley floor until some fifty years ago, is fairly dense. It is not of the distinctly tropical appearance which characterizes the forest at Quirigua, but has an abundance of tall, slender trees festooned with long moss (*Dendropogon usneoides* (L.) Raf.), with a dense undergrowth of shrubs. The splendid *cohune* or *manaca* palm (*Attalea cohune* Mart.), so impressive in the forest above Quirigua, is nowhere seen. Climbing palms are also absent, while the large leaved *aroids* and the *lianás* which are so abundant in lowland forests are comparatively rare.

The soil on the valley floor is a heavy, black, sticky clay loam of good depth. On the slopes and hillsides around the valley it is a dull brown or tawny clay, often gravelly in layers, and covered with a surface layer of black clay where it has not been exposed to

erosion. The black soil of the valley floor is excellent, from an agricultural point of view; it is sufficiently heavy so that its fertility is not easily exhausted, yet it is not too stiff to permit of tillage. The principal crops grown upon it at the present time are tobacco, maize, and sugar cane, the two former being grown alternately upon the same ground. Maize is planted at the beginning of the rainy season, about the first of May, and is harvested before the first of October. Tobacco is then planted in the same soil during the month of October, and comes to maturity after the end of the rainy season, in February and March. Tobacco is the principal export crop of Copan, while maize is extensively grown for local consumption. Sugar cane is cultivated in the lower part of the valley and is made into *panela* or crude sugar. In the manufacture of this product only the most primitive methods are employed.

Coming now to a consideration of the economic plants found in the valley of Copan at the present day, we may divide them, for convenience, into eight classes, namely: cereals and vegetables, fruits, beverage plants, plants used for seasoning and flavoring, fiber plants, plants used for coloring and dyeing, fence and hedge plants, and miscellaneous useful plants. In each division an attempt has been made to consider first the most important indigenous species, with a note as to their common names and uses; toward the end of each section will be found the introduced species in italics with a note as to their origin. These latter cannot have played a part in the life of the ancient Maya, but it seems worth while to include them, in order to complete the list of useful plants found in the valley at the present time.

CEREALS AND VEGETABLES

Zea mays L. Known in Spanish as *maiz*, in English, maize or Indian corn. Several different varieties are grown in the valley of Copan at the present day. Some of these differ in the time of maturing, others in the color of the grain. Maize was undoubtedly the great staple food crop of the ancient Maya, as it is today among their descendants. It is prepared for eating in very few ways, nearly the entire crop being consumed in the form of *tortillas*, thin round

cakes made by treating the maize with lye, grinding it coarsely on the *piedra de moler* or grinding stone, adding enough water to make a paste, and cooking the thin cakes for a few moments on a clay griddle.

Phaseolus spp. The *frijol*, or bean. Several species are represented among the beans commonly cultivated in Central America. The black bean, a form of *P. vulgaris* L., is by far the commonest. It ranks next to maize as a staple foodstuff among the present inhabitants, and its cultivation dates from remote antiquity.

Pepo maximus (L.) and *Pepo vulgaris* Moench. The *ayote*, or pumpkin and squash. Numerous varieties are grown, varying in size and shape as well as other characters. Often the vines are cultivated in maize fields; they are also grown in dooryards and about the huts of the natives. The flowers and the green fruits, while still very small, are sometimes cooked and eaten with meat. The mature fruit is an important article of food. The seeds (*ayoachlli*) are dried in the sun, after which the kernel is removed and eaten. The squash is known to have been an important food plant in the earliest times, and doubtless played an important part in the daily life of the ancient Maya.

Chayota edulis Jacq. (*Sechium edule* Swartz). The *güisquil*, usually called chayote in English. A cucurbit which is exceedingly common in Guatemala, and much esteemed by the Indians. Its pear-shaped or roundish fruits, three to six inches long, may be either smooth or prickly externally, white or green in color. When boiled they somewhat resemble summer squash. Many varieties are grown in this region. Doubtless their cultivation dates from a very remote period.

Ipomoea batatas (L.) Poir. The *camote*, or sweet potato. This is not a common crop in the vicinity of Copan, but is fairly well known to the better class of inhabitants. Purple and yellow varieties are grown, both rather inferior in character, as the tuberous roots are slender and small. Cultivated by the Aztec in Mexico, this root crop was probably used by the Maya as well.

Yucca elephantipes Regel. The *isote*, a plant often used for hedges and fence rows, but producing flowers which are eaten, most

commonly in the bud stage but also when fully developed. They have a bitterish taste when cooked, and are eaten with meat stews or are mixed with other vegetables to form a salad. Probably its cultivation in this region dates from very ancient times. Its leaves yield a fine fiber, but this does not seem to be used in Copan at the present time.

Lycopersicum esculentum Mill. The *tomate*, or tomato (Nahuatl, *xitomatl*). This common vegetable was cultivated by the Aztec. It should also have been known to the ancient Maya of Copan. At the present time it is a very common plant, but the varieties grown are inferior, the fruits rarely attaining to the size of walnuts. They are used principally to flavor stews.

Physalis pubescens L. The *miltomate*, usually known in English as ground-cherry or husk-cherry. Not common in Copan at the present time, but exceedingly abundant in the nearby Guatemalan highlands. It was cultivated by the Aztec, and may well have been used by the ancient Maya. It is used by the Guatemalan Indians as an addition to meat stews of all sorts.

Manihot utilissima Pohl. The *yuca*, or cassava plant. This was a staple food crop of the greater Antilles and of the Amazon basin in pre-Columbian times, as it is today. To the Mexicans it was known as the tree-camote (*quauhcamotl*) in these regions. It is occasionally seen at Copan and in other sections of Central America, but it is to be doubted if it was much cultivated here during the days of the Maya occupancy.

Dioscorea alata L. The *ñame* or yam. Scarcely known at Copan today, but said to be grown in a few gardens. It is, in all probability, a native of tropical Africa and was not cultivated by the ancient Maya. It was brought with negro slaves from Africa to the New World. The sweet potato seems to be preferred to it in this part of Central America at the present time.

FRUITS

Spondias purpurea L. The *jocote* or Spanish-plum (Nahuatl, *xocotl*, now usually known in Mexico as *ciruela*). One of the commonest indigenous fruit trees throughout this region. It is propa-

gated very easily, either by seed or by planting large cuttings, the latter sometimes being put in as fence posts. Several varieties or races are grown at Copan, varying in size, form and color of the fruit, as well as in flavor. Undoubtedly this was an important fruit among the ancients, as it is among their descendants of the present day. *Jocote* trees are common among the ruins of Copan.

Spondias lutea L. The *jobo*, or hog plum. A species much inferior to the last in quality of fruit. It is a common indigenous tree of this region. The fruits are small, and have a rather acrid taste, but are eaten by the natives.

Psidium guajava L. The *guayaba*, or guava. One of the commonest fruits of present day Copan, and doubtless well known to the ancients. It grows abundantly, both wild and cultivated. The fruits vary in size and shape, but most commonly are round, about an inch and a half in diameter. They are principally eaten out of hand.

Psidium molle Bertol. Also called *guayaba* at Copan, but known in some other regions as *guayaba ácida*, or sour guava. A very common indigenous plant, found on all the hills surrounding the valley. The fruit, which is greatly inferior to that of *P. guajava* in quality, is round, an inch in diameter, very acid when ripe. The plant is smaller than *P. guajava*, with the young leaves softly pubescent. The fruit does not seem to be much used at present.

Byrsonima crassifolia HBK. The *nance*, called *nanche* in Mexico (Nahuatl, nantzin). A very common indigenous tree throughout this part of Central America, frequently growing on rocky slopes. The small yellow fruits, the size of a large cherry, contain a large seed and are of rather harsh taste. They are nevertheless known to the ancient Maya.

Persea americana Mill. (*P. gratissima* Gaertn.). The *aguacate* (Nahuatl, ahucatl), known in English as avocado. In all probability this fruit was cultivated in ancient times. It is not common today at Copan, but there are a few trees along the river. They are all of the West Indian race, which is the most successful at elevations below 2,500 feet in this part of tropical America. It is unfortunate that more is not known concerning the part which the

avocado played among the Maya, now that this fruit is attracting so much attention in the United States.

Persea sp. The *shucte* or *chucte*, known as *coyó* in northern Guatemala. A species closely allied to the *aguacate*, but having a ferruginous tomentum on the young branchlets and lower surfaces of the leaves, while the flowers are marked with red at the base of the perianth segments. The fruit resembles that of the *aguacate*, but is different in flavor. As far as can be judged, the tree is indigenous in this region.

Calocarpum mammosum (L.) Pierre. The *zapote* (Nahuatl, *tzapotl*). Indigenous in this part of Central America, and likely an important fruit in ancient times. There are only a few trees in the valley of Copan today. Northward in Guatemala it is very abundant.

Achras zapota L. (*Sapota zapotilla* Coville). The *nispero* or *chico*, called *sapodilla* in English. A delicious fruit, common in the lowland forests of eastern Guatemala, and occasionally cultivated in the valley of Copan at the present day. Chicle, from which chewing gum is manufactured, is obtained from this tree. This must have been an important fruit among the Maya.

Muntingia calabura L. The *capulín*, a small tree which grows abundantly along the banks of the Copan river, especially in the vicinity of the ruins. Its fruits are red, the size of a cherry, sweet, with numerous minute seeds. Not a fruit of great merit.

Licania platypus (Hemsl.) Fritsch. The *sunza* or *sunzapote*. A large tree which bears rough, brown, irregularly shaped or oval fruits the size of a small melon, with a large fibrous seed and scanty pulp resembling the true *zapote* in flavor. A few trees are growing near the present town of Copan. Indigenous in this general region.

Hymenaea courbaril L. The *guapinol* (Nahuatl, *quauhpinolli*, "pinoli tree"). A leguminous tree producing short plump pods containing a sweetish pulp (pinoli) eaten by the Indians. Widely distributed in Central America, and known, doubtless, to the ancients.

Annona reticulata L. The *anona*, or custard-apple. This tree is wild and abundant in the valley, principally along ravines and

water courses. Its heart-shaped fruits are not as good as those of the *anona blanca*, but are esteemed by the natives. Probably known here in ancient times.

Annona purpurea Moc. & Sessé. The *suncuya*. A tree with much larger and coarser leaves than the preceding, and enormous round fruits, covered with sharp conical protuberances. The flesh is orange colored, and resembles in flavor the North American papaw (*Asimina triloba* Dunal). The natives do not consider it wholesome; it is commonly believed, in fact, to induce fever. It is unquestionably indigenous in this region, being found abundantly along water courses.

Annona diversifolia Safford. The *anona blanca*. Comparatively rare, but one of the finest *anonas* grown here. The fruits are similar to those of *A. reticulata* in form, but larger, and glaucous externally. The flavor is sweet and pleasant. This is a really good fruit which must have been esteemed by the ancient Maya.

Annona muricata L. The *guanábana*, or soursop. Not common, but a few trees are said to be growing in some of the *fincas* near Copan. Probably its introduction into this valley is comparatively recent.

Casimiroa edulis LaLlave & Lex. The *matasano*, or white sapote. Not so abundant here as it is in the highlands of Guatemala, but occasionally seen. One of the common indigenous fruits of Central America. It must certainly have been known to the ancients.

Vitis caribaea DC. The *uva silvestre*, or wild grape. An indigenous species which climbs over trees in the ravines around the edge of the valley. Its fruits are small and sour, but are used by the natives.

Carica papaya L. The *papaya*. An important fruit commonly cultivated in the gardens of Copan at the present day. It must have been known to the ancient Maya, since it is indigenous in this part of tropical America.

Cereus sp. Erroneously called *tuna*, which name properly belongs to species of *Opuntia*; its correct name in Spanish is *pitaya* or *pitahaya*. This cactus, with 3-angled stems and large rose-colored fruits, is grown in one or two gardens.

Ananas sativus Schult. The *piña*, or pineapple. Grown in several gardens near Copan, and undoubtedly one of the fruits cultivated by the ancient Maya.

Inga radians Pittier. The *paterna*. A leguminous tree producing a large, flattened pod containing a sweet pulp. Not common in Copan at present, but abundant in Guatemala. It may likely have been one of the food plants of the ancients.

Anacardium occidentale L. The *jocote-marañon* or cashew. Rarely seen, but there are a few trees in the valley. While indigenous in northern South America, it probably was not known this far north before the Conquest.

Musa sapientum L. and *M. paradisiaca* L. The *guineo* or banana, and the *plátano* or plantain. Both these species are abundant at Copan, several varieties of the banana being grown. They must have been introduced since the Conquest, and hence were not known to the Maya.

Mangifera indica L. The *mango*, a well known East Indian fruit introduced since the Conquest, and now very common in tropical America. It is quite successful at Copan, and has become one of the commonest fruits. The varieties seen here are very inferior, however.

Citrus aurantium L., the *naranja dulce* or sweet orange; *C. limetta* Risso, the *lima* or sweet lime; *C. limonia* Osbeck, the *limón* or sour lime; *C. decumana* L., the *cidra* or citron. All these citrus fruits, of Asiatic origin, have been introduced since the Conquest and are now grown in the gardens of Copan. The sweet orange and sour lime are particularly common. The citron is rare.

Cocos nucifera L. The *coco* or coconut. Whether it be considered that this plant is of Asiatic or American origin, it seems practically certain that it was not known in Central America before the advent of the Spaniards. It is now fairly abundant in this region.

Punica granatum L. The *granada*, or pomegranate. A few bushes are growing in Copan dooryards. The species is of recent introduction, its home being in the Orient.

Tamarindus indica L. The *tamarindo* or tamarind. This old-world tree is of very recent introduction in Copan, there being only a few young specimens four or five feet high.

BEVERAGE PLANTS

Theobroma cacao L. and *T. Ciocarpum* Bernoulli. *Cacao* or chocolate. Undoubtedly the Maya prepared one of their important beverages from cacao. The seeds were also used as currency by the Maya in Yucatan at the time of the Conquest, and even much later.

Theobroma bicolor Humb. & Bonpl. The *patashte*. This species is very similar to the *cacao*, but the seeds are larger and not so rich in flavor. It is indigenous in this part of Central America. Probably it served in ancient times, as it does today, to prepare an inferior beverage, or to mix with *cacao*.

Coffea arabica L. *Café* or coffee. Of oriental origin, and not introduced into America until some time after the Conquest. It is now cultivated to a considerable extent in the vicinity of Copan.

PLANTS USED FOR SEASONING AND FLAVORING

Capsicum frutescens L. *Chiltepe*. This is the small, perennial species of chile pepper, whose fruits, though no larger than peas, are exceedingly piquant. It is one of the common plants growing on the ruins at the present time. Doubtless it served in ancient times, as it does today, to make chile sauce.

Capsicum baccatum L. *Chile* or chile pepper. The annual chiles are much larger than *C. frutescens* and not so hot. They are cultivated in the gardens of the natives. Several varieties are common.

Vanilla planifolia Andr. *Vainilla* or vanilla (Nahuatl, *tlilxochitl*). The climbing orchid which produces the vanilla "bean" is said to occur in the forest not far from Copan.

FIBER PLANTS

Gossypium peruvianum Cav. *Algodón* or cotton. This was one of the principal textiles of the ancient Maya, furnishing the material for most of their clothing. While not grown commercially near Copan at the present time, the few plants seen in dooryards about the town indicate that it thrives here, and it may have been cultivated extensively in ancient times. Possibly other species than *G. peruvianum* have grown here.

Sabal sp. Commonly termed *palma real* (royal palm). An indigenous palm with fan-shaped leaves, somewhat resembling the cabbage palm of Florida in general appearance. It is common in the valley of the Copan river a short distance below the present town, but is not now seen in the immediate vicinity of the ruins. It furnishes most of the fiber used by the present inhabitants of the valley to manufacture hats, mats, and other useful articles. Doubtless it was put to similar uses in ancient times.

Carludovica palmata R. & S. This plant, which yields a finer fiber than the *palma real*, is not found in the immediate vicinity of Copan, but is said to grow at lower elevations not far distant. It furnishes the fiber from which the so-called Panama hats are made. It is used by the natives of this part of Central America, though the manufacture of hats is not an important industry.

Acrocomia vinifera Oerst. The coyol palm. The fiber obtained from this palm is not much used at the present day. The fruit is edible and occasionally seen in the markets. The plant is one of the characteristic indigenous species of the region.

PLANTS USED FOR COLORING AND DYEING

Bixa orellana L. *Achiote*, known in English as arnotto. A small tree occasionally seen in this region. The outer covering of the seed is fleshy and yields a brick-red coloring matter much used to color foodstuffs and beverages, and occasionally for other purposes.

Jacobinia tinctoria (Oerst.) Hemsl. *Saca-tinte* (Nahuatl, *mo-huitli*). A small shrub yielding a blue dye similar to indigo. Fairly common in gardens.

Due to the widespread use of aniline dyes throughout Central America at the present day, it is difficult to determine many of the plants which yielded dyes in ancient times. Doubtless there were a number of species utilized by the ancient Maya whose value is not known to most Central Americans of the present day.

FENCE AND HEDGE PLANTS

Bromelia pinguin L. The *piñuela* or *piñuela de motate*. A plant allied to the pineapple and resembling it in growth. It is

larger and coarser, however, with the leaves more coarsely serrate. It is commonly planted to form impenetrable hedges, and the small acid fruits which it produces are occasionally used to make refreshing drinks.

Erythrina corallodendron L. *Flor de pito*, or coral tree. A small tree, easily propagated from cuttings, which is planted for hedges and produces edible flower buds as well. These buds, which are picked when quite young, are boiled and eaten as a vegetable. The seeds of this plant are used by the *brujos*, or witch doctors, of Guatemala in divining. Probably cultivated in ancient times.

Gliricidia maculata HBK. *Madre de cacao*. A small tree producing handsome pink flowers in the greatest profusion. It grows readily from cuttings, and for this reason, probably, is commonly planted in fences. It is grown for shade in cacao plantations, a use which seems to have come down from the earliest times.

Jatropha curcas L. *Piñon* or physic nut. A plant of tropical American origin, not as common at Copan as the preceding. Its oily seeds are a drastic purgative, little used. Usually found in hedges or fence rows.

MISCELLANEOUS USEFUL PLANTS

Nicotiana tabacum L. *Tabaco* in Spanish (Nahuatl, yetl or picietl), tobacco in English. One of the principal crops of present-day Copan. The use of this plant as a narcotic was common among the ancient inhabitants of tropical America.

Crescentia cujete L. The *jicara* or calabash (Nahuatl, quauhtecomatl, "tree gourd"). This is one of the most useful trees of the region, producing receptacles which are found in every household. Three varieties are known at Copan, a small, round-fruited one called *morro*; a larger, elongated one called *jicara*, and a large oblate one known as *guacal*. The tree is indigenous in this region and very abundant. Undoubtedly it was as useful to the ancient Maya as it is to the Central Americans of today.

Curcubita lagenaria L. The *tecomate*, or gourd (Nahuatl, tecomatl). Like the *jicara*, this plant produces many useful receptacles and is seen in nearly every garden. The gourd is one of the very

few useful plants which are known to have been distributed throughout both hemispheres before the discovery of America.

Ricinus communis L. The *higuerillo* or castor bean. Very abundant along the river, especially in the vicinity of the ruins. The oil obtained from its seeds is useful in several ways.

Pinus tenuifolia Benth. The *ocote* pine (Nahuatl, *ocotl*, "pitch"). One of the characteristic trees of the region, growing in great abundance on all the hillsides. Its wood, which is saturated with resin, is termed *ocote* and is used to kindle fires and for illuminating. It is the only material used for illumination by the poorer natives. It must have been a very useful species to the ancient Maya.

Protium Copal Engl. Copal. A small tree common on the hillsides. A gum is obtained from incisions in the trunk which is burned as incense, and plays an important part in the religious ceremonies of the Indians. Most probably it was used in the same way by the ancient Maya. There are several other plants in Central America which furnish resins used in the same manner.

Castilla sp. *Hule* or rubber tree (Nahuatl, *olli*, or *uli*). Wild in the vicinity of Copan, but not cultivated commercially. Probably its latex was utilized by the ancients.

Saccharum officinarum L. *Caña de azucar*, or sugar cane. A plant of Asiatic origin, introduced since the Conquest and now an important crop in Copan.

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